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Metropolitan District Commission

Water Supply Study and
Environmental Impact Report–2020

Task 1:
Water Needs Report

Submitted To:
Metropolitan District Commission

By:
Wallace, Floyd, Associates Inc.

Prepared By:
Wallace, Floyd, Associates Inc.
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William Melia
New England Research, Inc.
J.E. Edinger Associates, Inc.

October, 1983

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METROPOLITAN DISTRICT COMMISSION

Water Supply Study and Environmental Impact Report - 2020

TASK 1

WATER NEEDS REPORT

Summary Report of:

- Water Demand Projections
- Demand Management
- Safe Yield - Existing System

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WATER NEEDS

SUMMARY OF FINDINGS

1. Metropolitan District Commission (MDC) presently uses three sources of supply: Quabbin Reservoir; Wachusett Reservoir; and the Ware River. These sources combined can safely yield about 300 million gallons per day (MGD) over a long dry period.

2. Demand projections indicate that water demand will increase. The MDC will be called upon to supply 393 MGD in 1990, 409 MGD in 2000, and 453 MGD by the year 2020.

3. A demand management program designed for implementation by the MDC will reduce the projected demands by 32 MGD by 2020.

4. The MDC must plan to supply an additional water need of 60 MGD in 1990; 75 MGD in 2000; and 120 MGD by 2020 for its current user communities and potential future users as shown in Table 1, "MDC Water Needs Projections".

Table 1. MDC Water Needs Projections (MGD)

	1990	2000	2020
Projected MDC Water Demand	393.0	409.0	453.0
Potential Savings from Water Conservation	(34.0)	(32.0)	(32.0)
- Current Users	(33.6)	(31.6)	(31.8)
- Potential Future Users	(.5)	(.5)	(.6)
Safe Yield of Current MDC Supplies	(300.0)	(300.0)	(300.0)
Water Needs	60	75	120

INTRODUCTION

The Metropolitan District Commission (MDC) is conducting a study of the 40-year water needs of the cities and towns it is responsible for supplying. The MDC Water Division currently provides water for over two million people in 45 municipalities in metropolitan Boston and central Massachusetts.

Since 1960 the demand for water from the MDC has grown by about 30 percent. During the decade of the 1960's, water use increased because of growth in population, employment and industrial output, and stabilized in the 1970's because of population shifts and employment shifts away from water-intensive industries. Since 1969 the total demand on the MDC system has exceeded the amount of water that safely can be withdrawn from the sources of supply. In order to plan for the future water supply needs of its users and to evaluate means of meeting these needs, the MDC has undertaken a long-range Water Supply Study and Environmental Impact Report (EIR).

The first major task in this Water Supply Study is to estimate the future water needs of the MDC water users for the years 1990, 2000, and 2020. This report outlines those water needs and is a summary of more detailed information involved in developing this estimate. For a detailed discussion of this work, the reader should refer to the following reports: Task 1: Water Demand Projections, Task 3: Demand Management, and Task 4: Safe Yield-Existing System reports.

The determination of the MDC water needs began with the development of the water demand projections for the current users of MDC water and for potential future users of the system. Water demand is defined as the amount of water that would be sought by the users from the MDC in the future, unconstrained by any new initiative to manage demand. The water demand projections were based on a detailed analysis of all components of water use in the base year of 1980 and how those uses may vary over time.

In a separate report, the costs, water savings and impacts of eleven programs designed to reduce the demand on the MDC system were assessed. From this demand management analysis, the MDC selected a specific water conservation plan to implement, and the water savings anticipated from this program were subtracted from the demand projections.

The amount of water available in MDC's present supplies, i.e. the current safe yield, was also subtracted from the total water demand projection to determine a final amount of water need for planning. Nine alternative water supply sources to meet these future needs, including demand management and watershed management programs, will

be evaluated in the EIR and a preferred alternative will be selected.

FINDINGS

As summarized previously, the major findings of this work to develop the water needs projection include the following.

- If no action is taken to reduce demand, it is projected that the demand for MDC water in the year 2020 will be about 453 million gallons per day. Demand in 1990 will be 393 MGD and 409 MGD in 2000.

- The demand management program to be implemented by the MDC is anticipated to reduce that projected demand by approximately 32 MGD. The need for MDC water above present supplies would then be 120 MGD in 2020.

- The present sources of supply serving MDC water users have a combined safe yield of approximately 300 MGD.

- The MDC Water Supply Study and EIR will evaluate the impacts of nine alternative actions and combinations of actions designed to meet the need for an additional 120 MGD in the year 2020. The impacts of additional water need amounting to 60 MGD in 1990 and 75 MGD by the year 2000 will be analyzed.

WATER DEMAND PROJECTIONS

POTENTIAL SERVICE AREA

Future water needs are projected for both communities that are presently served by the MDC, as well as for communities that may need water from MDC sources in the future. Included in the potential service area are 30 communities which are presently fully-supplied by the MDC, and 14 communities which are partially-supplied by the MDC[1]. Also, 13 communities with potential shortfalls in local supply but which are not currently served by the MDC are included as potential future users. The communities for which water needs were projected are listed in Table 2, "Communities in the Potential Service Area" and shown in Figure 2, and are the result of a detailed analysis described in the Task 1: Planning Area report.

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[1] Since this work was begun the City of Lynn has become a member of the Metropolitan Water District.

Table 2. Communities in the Potential Service Area

CURRENT USERS OF THE MDC SYSTEM

Arlington	Stoneham	Cambridge (P)
Belmont	Swampscott	Canton (P)
Boston	Waltham	Needham (P)
Brookline	Watertown	Peabody (P)
Chelsea	Winchester (P)	Wakefield (P)
Everett	Winthrop	Weston (P)
Lexington	Chicopee *	Wellesley (N) (P)
Malden	Wilbraham *	Woburn (P)
Marblehead	Clinton *	Worcester * (P)
Medford	Melrose	Leominster * (P)
Milton	Framingham * (P)	Northborough * (P)
Nahant	Marlborough * (P)	Lynnfield Water District
Newton	Southborough *	Revere
Norwood	Quincy	South Hadley Fire District No. 1 *
Somerville	Saugus	
	Lynn[1] (P)	

Special Users

Fernald School & Metropolitan State Hospital *	Westboro State Hospital *
MDC Parks Division *	G.S.A. *
MDC Sewerage Division *	

POTENTIAL FUTURE USERS

Acton[2]	Holden	Stoughton +
Athol[2]	Hudson	Tyngsborough[3]
Bedford +	Middleton +	Whitman
Brockton	Rutland	Wilmington +
Danvers +		

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* Non-member of Metropolitan Water District
(P) Partially supplied
(N) Currently takes no supply
\+ Legally-eligible communities are at least in part within fifteen miles of the State House according to the General Laws, Chapter 92, Section 10.
1 Since this work was begun the City of Lynn has become a member of the Metropolitan Water District.
2 Athol will be included only in the analysis of the Millers River alternative.
3 Tyngsborough will be included only in the analysis of the Merrimack River alternative.

WATER DEMAND

It is estimated that the demand on the MDC for water will be on the order of 453 million gallons per day (MGD) by the year 2020. The 2020 figure represent a 30 percent increase over the 343 MGD demand on the system in 1980. This projection incorporates the following demands on the MDC system, summarized in Table 3, "MDC Water Demand Projections":

Base Demand

- the projected use of the current MDC user communities (369 MGD) by 2020, including special users and MDC system usage, totalled under the heading "Base Demand" in Table 3;

Legal Obligation

- legal obligations on the MDC to supply additional water to present users or to supply legally eligible communities (51 MGD); and,

Potential Future Users and Contamination

- potential future users and users requiring new supply due to contamination of local supplies by 2020 (33 MGD).

BASE DEMAND ON MDC

The communities currently served by the MDC used a total of 375.5 MGD in 1980, but since some of these communities are only partially-supplied by the MDC, 313 MGD was provided by the MDC to its current users.

Total water use in each community is made up of three components: metered domestic use, metered nondomestic use, and unaccounted-for water use. Each component represents about one-third of the total use in the 44 communities currently served by the MDC, as shown in Figure 1: "Water Use by Component".

Projections of future water demand were made for each of these components separately in order to better assess the many factors which affect different types of use and to have better data for estimating the impact of various demand management strategies. These projections took into account current changes in water use practices and technology, such as water-saving plumbing fixtures. The projections were developed by combining projected patterns for domestic and non-domestic water use in each community and the projected changes in the number and type of users. The Water Demand Projections report provides a detailed description of the development of these projections.

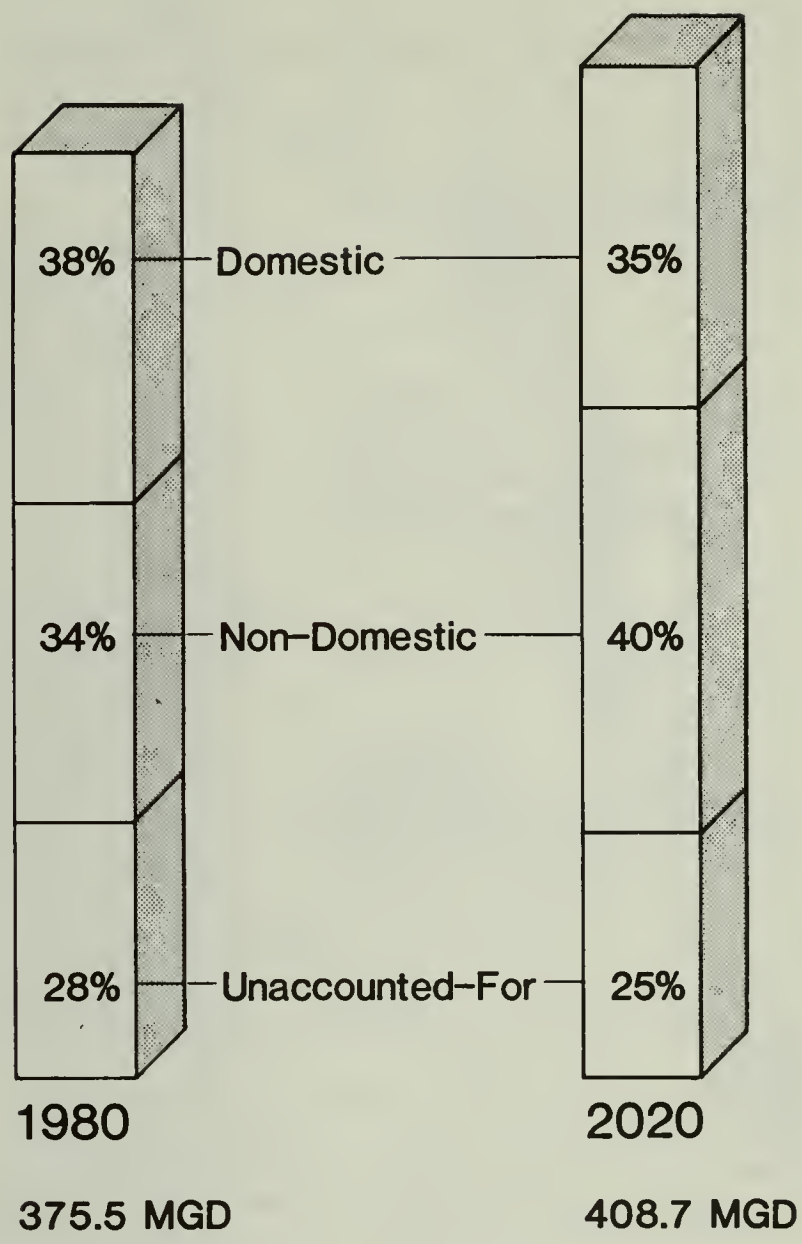
Table 3. MDC Water Demand Projections (MGD)

Water Use Categories	1980	1990	2000	2020
MDC Water Use:				
Metered Domestic Water Use	143.0	138.6	136.5	141.8
Metered Nondomestic Water Use	126.1	136.9	145.0	164.9
Unaccounted-for Water Use	105.9	88.4	91.0	102.0
Subtotal	375.5[1]	363.9	372.5	408.7
Drought		5.0	5.0	5.0
Lynn as Member [2]			0.5	2.7
MDC System Usage	30.1	21.0	21.0	21.0
Total Water Use by Current Users	405.6	389.9	399.0	437.4
Amount Supplied Locally by Partial Users	(62.5)	(62.4)	(64.3)	(68.7)
Base Demand	343.1	327.5	334.7	368.7
Additional Demand:				
Legal Obligations		50.7	51.1	50.8
Contamination		11.0	19.0	28.0
Potential Future Users		3.7	4.0	5.2
Uncertainty Range		365-421	371-447	388-518
Capacity Planning Estimate		393	409	453

[1] Due to disaggregation of total and adjustment of components, numbers do not add.

[2] Since this work was begun the City of Lynn has become a member of the Metropolitan Water District.

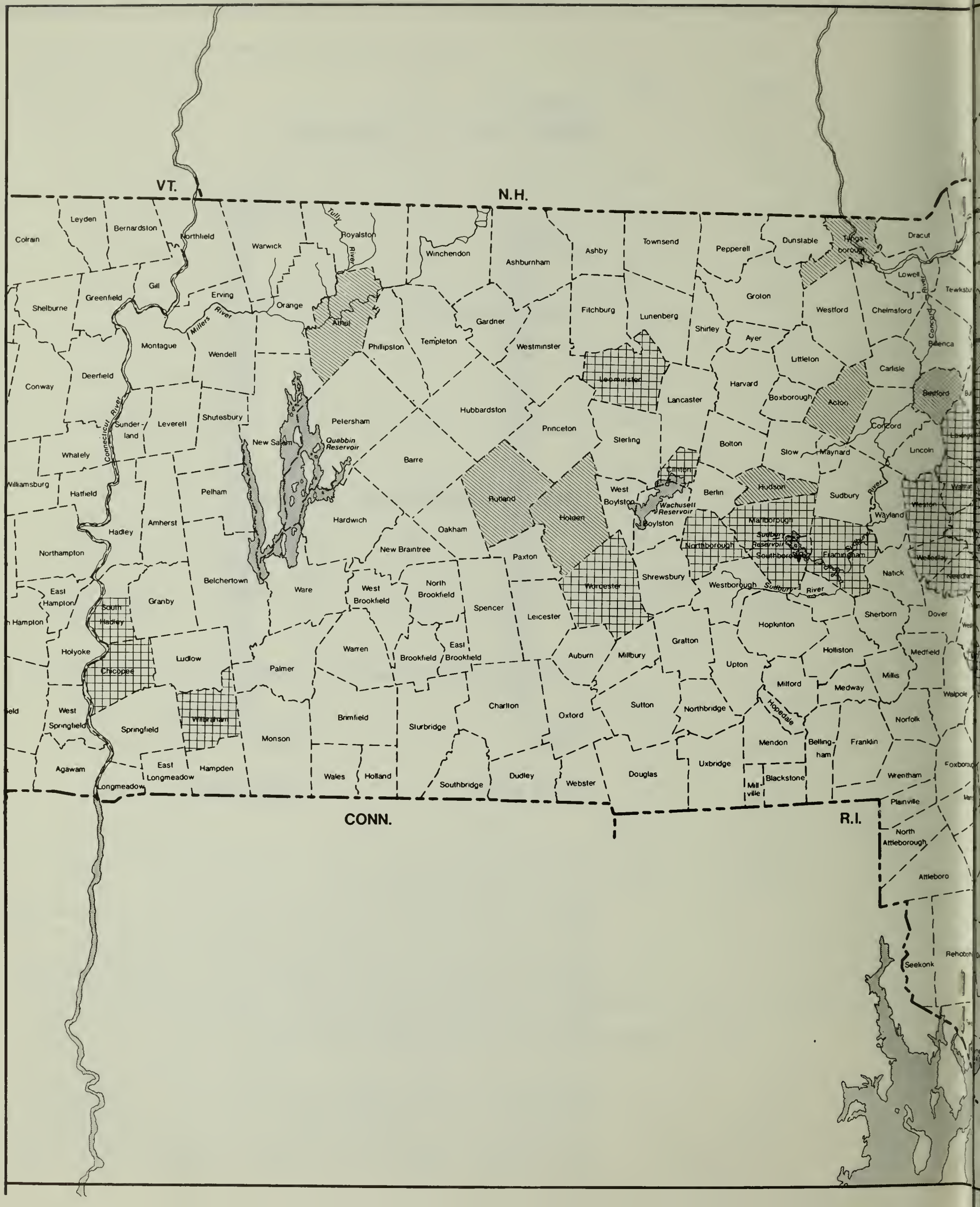
Water Use by Component

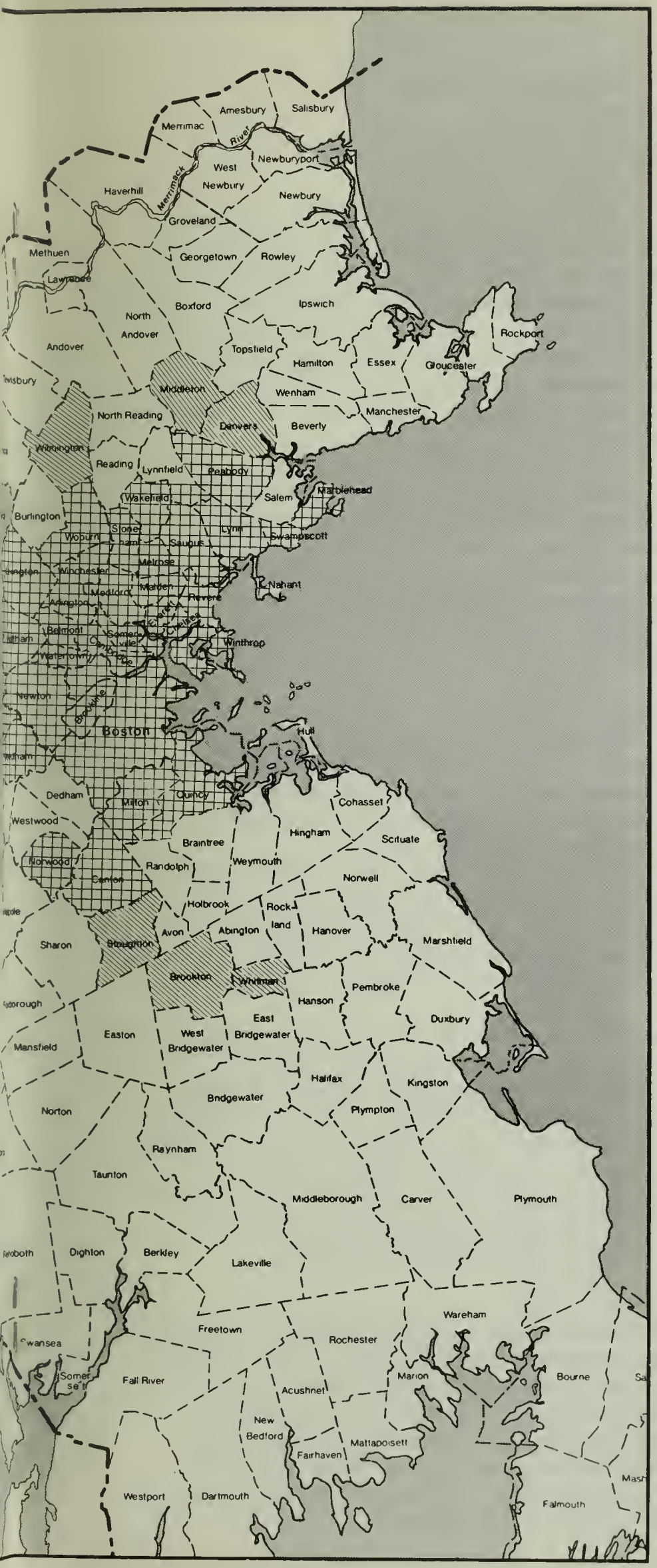


Metered Domestic Water Use

Metered domestic use in 1980 amounted to an estimated 143 MGD for the 44 MDC communities and represented 38 percent of total water used by these communities. About 12 percent of this use was estimated to be outdoor seasonal use; 66 percent was bathroom related (primarily bathing and toilet flushing); and the remaining 22 percent was used in the kitchen and laundry.

A relatively stable amount of metered domestic use is projected for the 40-year planning period. The analysis of domestic use indicates that the effect of projected population and housing increases will be generally offset by projected reductions in water consumption due to the


VT.
N.H.
CONN.
R.I.
Leyden
Bernardston
Colrain
Northfield
Warwick
Tully River
Royalston
Winchendon
Ashburnham
Ashby
Townsend
Pepperell
Dunstable
Tyngsborough
Dracut
Lowell
Tewksbury
Concord River
Gill
Greenfield
Shelburne
Erving
Millers River
Orange
Athol
Phillipston
Templeton
Gardner
Westminster
Fitchburg
Lunenberg
Groton
Shirley
Ayer
Westford
Chelmsford
Billerica
Montague
Wendell
Deerfield
Conway
Connecticut River
Sunderland
Leverett
Shutesbury
Petersham
New Salem
Quabbin Reservoir
Hubbardston
Princeton
Leominster
Lancaster
Harvard
Littleton
Boxborough
Acton
Carlisle
Bedford
Concord
Lincoln
Sterling
Bolton
Stow
Maynard
Clinton
Berlin
Hudson
Sudbury
Sudbury River
Wayland
Weston
Whately
Williamsburg
Hatfield
Pelham
Amherst
Barre
Rutland
Holden
West Boylston
Wachusett Reservoir
Boylston
Marlborough
Northborough
Southborough
Framingham
Natick
Wellesley
Needham
Hadley
Northampton
Hardwich
Oakham
New Braintree
Paxton
Shrewsbury
Worcester
Westborough
Sudbury River
East Hampton
Hampton
South Hadley
Granby
Belchertown
Ware
West Brookfield
North Brookfield
Spencer
Leicester
Sherborn
Dover
Holyoke
Chicopee
Ludlow
Palmer
Warren
Brookfield
East Brookfield
Auburn
Millbury
Gratton
Upton
Hopkinton
Holliston
Medfield
Millis
Medway
Milford
Hopedale
Mendon
Bellingham
Franklin
Norfolk
Walpole
Foxboro
Wrentham
Plainville
West Springfield
Springfield
Agawam
Williamsburg
East Longmeadow
Longmeadow
Hampden
Wales
Holland
Brimfield
Monson
Sturbridge
Southbridge
Charlton
Oxford
Sutton
Northbridge
Dudley
Webster
Douglas
Uxbridge
Millville
Blackstone
North Attleborough
Attleboro
Seekonk
Rehoboth



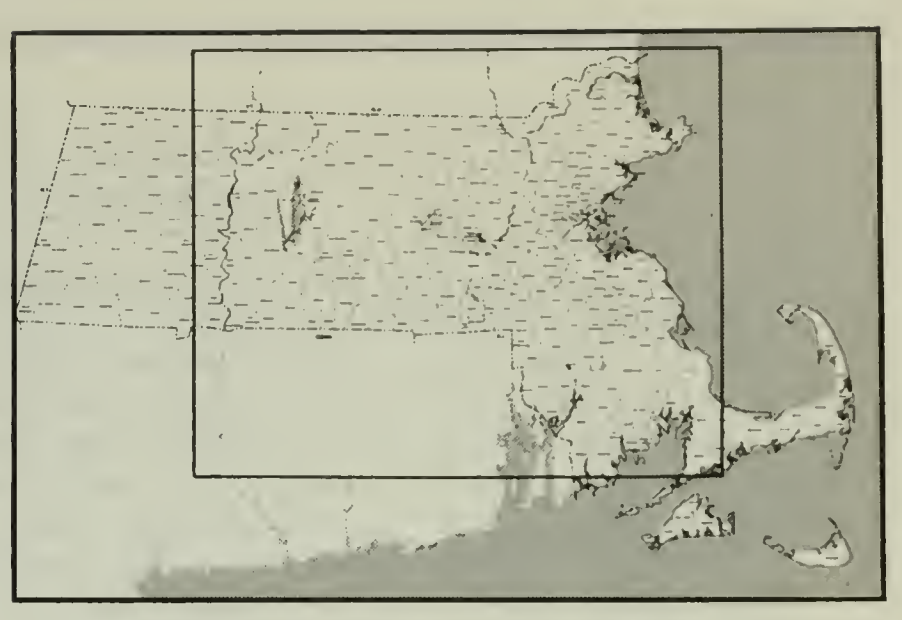


Figure 2.
Communities in Potential Service Area

Legend

Communities Currently Supplied by MDC

Potential Future Users

0 5 10 Miles

MDC Water Supply Study and EIR 2020 Phase II

Metropolitan District Commission

Wallace, Floyd Associates, Inc.
Architects/Planners

increased use of water-saving fixtures recently mandated by the state plumbing code.

Metered Nondomestic Water Use

Metered nondomestic use by commercial, industrial, and institutional users amounted to an estimated 126 MGD for the 44 MDC communities in 1980 and was 34 percent of the total water used by these communities. Major users, each of which consumes over 10 million gallons per year (MGY), account for about 55 percent of the total nondomestic use. Sanitary use represented 49 percent of the total nondomestic use in 1980, with the rest being cooling and industrial process use.

The forecasts show a slight-to-moderate increase for metered nondomestic use. This reflects the effect of moderate employment increases and substantial output increases which are offset, in part, by a shift to less water-intensive industries, such as electronic and computer manufacturing, and more efficient water and energy use practices.

Unaccounted-for Water

Unaccounted-for water is the amount of water purchased by the community minus the metered water use of the customers. The elements of unaccounted-for water include: domestic and nondomestic meter underregistration; public unmetered use; potentially recoverable leakage; unavoidable leakage; and, other unaccounted-for water. The 1980 total unaccounted-for water of current MDC users was estimated to have been 105.9 MGD in 1980, or 28 percent of total supply.

The total amount of unaccounted-for water is expected to decline by approximately three percent by 2020 due primarily to improved meter accuracies and municipal recovery of leakage, an effort funded in part by state grants, assumed for these projections to end after 1990. Most of this recovery is expected by 1990, when unaccounted-for water is projected to decrease by 17.5 MGD. It is assumed that unaccounted-for water will increase to 102.0 MGD by 2020 without further intervention.

MDC system usage is water that is used within the MDC's own transmission and distribution system. This includes leakage and water used for system maintenance or lost during system repairs. While system usage amounted to 30 MGD in 1980, several major improvements and repairs occurred in that particular year. Assuming that this will not recur in any one year, 21 MGD is the projection for average system usage in the future.

ADDITIONAL DEMAND

Legal Obligations

A number of communities which are currently partially-supplied by the MDC have the legal right either by contract, membership in the District, or by statute to take a greater amount of water from the MDC than they are presently taking. The base demand projections for these communities only include an average of their historical MDC use. In planning for the future demands on the system, the MDC legal obligations have been taken into account. Over the 40-year planning period conditions could change due to drought or loss of local supplies that would mean these communities would exercise legal rights to the full amount of water specified. These water demands are summarized in Table 4, "Water Demand Projections for Partially-Supplied Communities".

Current members of the Metropolitan Water District are entitled to take their full supply of water from the MDC, although some members are now only partially-supplied by the MDC. The full legal obligation to these members by the MDC would represent about 37 MGD above the base demand for the future.

Some communities which have contracts specifying the maximum amount of water that can be taken from the MDC, are currently taking less than this contract amount. The legal obligation of the MDC to these contract users represents approximately 15 MGD above the base demand.

Since communities within 15 miles of the State House are eligible to become members of the MDC Water District according to Massachusetts General Laws, Chapter 92, §10(1), the MDC must plan to supply those eligible communities which are projected to face local water shortages by 2020. Less than two MGD is included in the projection to meet the demands of these communities: Bedford, Danvers, Middleton, Stoughton, and Wilmington.

Contamination

A total of 28 MGD is incorporated into the water demand projection to provide for the additional demand on the MDC potentially resulting from loss of local supplies to new contamination by 2020. By applying a rate of contamination to the local supplies, an estimate of future contamination was developed. This estimate assumes an increasing rate of contamination over the planning period and the likelihood that communities in more urbanized areas will experience a greater loss of local water supplies.

Table 4. Water Demand Projections for Partially-Supplied Communities (MGD)

Communities	Projected 2020 Demand	Local Safe Yield Used [1]	MDC Base Demand 2020 [2]	MDC Maximum Obligation [3]	Legal Obligation 2020 [4]
Members					
Cambridge	19.39	17.60	1.79	Not Applic.	17.60
Canton	3.91	1.60	2.31	3.00	1.60
Needham	4.13	2.50	1.63	None/12.50	2.50
Peabody	9.20	5.80	3.40	None	5.80
Wakefield	2.78	0.66	2.12	None	0.66
Wellesley	3.31	5.20	0.00	7.50	3.31
Weston	1.25	0.00	1.25	None	0.00
Winchester	2.72	0.70	2.02	None	0.70
Woburn	9.13	4.50	4.63	13.00	4.50
Subtotal	55.81		19.14		36.67
Nonmembers					
Framingham	9.73	0.25	9.48	17.50	0.25
Leominster	11.61	12.40	1.00	5.00	4.00
Marlborough	5.98	0.60	5.38	4.00	0.00
Northborough	1.02	0.62	0.40	None	0.62
Worcester	27.09	29.00	0.00	10.00	10.00
Subtotal	55.43		16.26		14.87
Total	111.24		35.40		51.54

[1]The estimate of safe yield of local systems used in the determination of base demand on the MDC.

[2]Projection of MDC water use based on proportion of demand taken from MDC historically.

[3]Some contracts have a specified limit on the maximum amount of water a community may take.

[4]The amount of water, above the base demand, that the MDC is currently obligated to provide.

Potential Future Users

Thirteen communities are expected to face water shortages that might require them to seek supplemental supplies from the MDC. The additional demand on the MDC by these potential future users is projected to be approximately seven MGD by 2020 of which five is from communities which do not currently have rights to MDC supply. Brockton is the largest of these potential users.

PHASE I DEMAND PROJECTIONS

Earlier in this study (Phase I) preliminary water demand projections were prepared. These are described in the memorandum entitled "Preliminary Projections of Water Demand for Communities Served by the MDC and Other Communities Located in the Study Area" (September, 1981). Although these preliminary projections indicated a higher demand for water, they are not directly comparable to the projections described here since they are different in several ways. The Phase I numbers were based on a general per capita water use factor, rather than the more detailed water sector analysis described here. A higher population projection was employed in Phase I (the Office of State Planning - 208 Wastewater projections, adjusted for 1980 Census results). The projections incorporate the control forecast of the University of Massachusetts, Amherst model (the Massachusetts Economic Policy Analysis Model).

The information on the safe yield of local water supplies was different in Phase I. The current projections utilize updated information from the Division of Water Resources of the state Department of Environmental Management. In addition, the disaggregation and separate analysis of water use categories allow the incorporation of changes in use patterns due to ongoing water conservation programs, while the Phase I projections used a per capita water use factor.

DEMAND MANAGEMENT

Following analysis of 11 possible demand management techniques, the MDC selected a water conservation plan for future implementation. The detailed results of the demand management analysis is included in the Task 3: Demand Management Report. This analysis identified the costs, water savings, and impacts which might be anticipated from the implementation of each of these programs within the planning area. This analysis also included the combination of individual programs in four illustrative water conservation plans with costs and water savings. These plans demonstrate how the costs and water savings of individual programs may change when

implemented simultaneously. In some instances the water savings may be interactive rather than additive.

MDC CONSERVATION PLAN

The water conservation plan selected by the MDC includes programs that would affect all water use sectors, domestic, nondomestic, and unaccounted-for. The phrase "Demand Management" is used instead of water conservation to reflect the long-term implementation and reductions in demand planned for these programs as well as the improved management techniques incorporated in them.

The plan includes the following programs:

- leak detection and repair for user community distribution systems;
- high level of effort domestic device retrofit;
- moderate level of effort pricing;
- moderate level of effort nondomestic conservation; and,
- low level of effort nonemergency education.

The leak detection and repair program provides funds to MDC user communities to conduct complete leak detection and repair programs over two consecutive years, with subsequent programs every two years throughout the planning period. The MDC will continue to provide training in the use of leak detection and repair equipment to water department personnel in those communities which decide to perform their own work.

The high level of effort program for domestic device retrofit consists of providing funds for the purchase and installation of water saving devices in all households in MDC-user communities. The devices to be installed include low flow showerheads, faucet aerators, plastic bottles for toilet tank water displacement, and hose attachments for those residents who can reduce outdoor water use. An education program is an important component of this retrofit program and focuses on announcing the installation program and encouraging participation. The program includes telephone or mail follow-up once every two years following installation to determine whether devices are still in use and if additional education material is needed.

The MDC will encourage the broader use of increasing block rate structures through the pricing program. A comprehensive education program will focus on municipal water departments to accomplish this objective.

In implementing the moderate level nondomestic conservation program, the MDC provides educational materials and technical assistance to encourage the 400 major water users (over 10 MGY) to implement all low cost and cost-justified measures. In this program, conservation measures that have a payback period of less than three years are seen as cost justified to the industry and those that have a payback period of three to ten years are marginally cost justified. Minor water users (less than 10 MGY) would be encouraged to implement water conservation measures also, although the main focus of the program is major users. This is because cooling and process water use offer the greatest potential for reductions in water use, and these uses are more prevalent in large users.

The education program includes a regional media campaign utilizing public service messages on television, radio, and newspapers to convey the message of water conservation and a support campaign utilizing pamphlets, school programs, and printed materials. These techniques are an extension of MDC's on-going water conservation education program. Communities would be encouraged to use MDC-produced material for consistency.

In addition to the water savings anticipated from the MDC demand management plan, current public and private conservation programs will save water. These savings are incorporated into baseline demand projections. The long-term effect of the Massachusetts plumbing code requiring low-flow fixtures is incorporated in these projections through on-going rates of rehabilitation and repair. For example, this plumbing code change is projected to reduce domestic bathroom water use by a factor of 15 percent for existing housing units and 25 percent in new housing units. The water demand projections for nondomestic water use already incorporate the on-going conservation work that has been initiated by major water users.

The projected savings from the MDC plan are fairly constant throughout the planning period. The water savings are 33.6 MGD in 1990 for current users and 31.8 MGD in 2020. The unit cost of the plan, based on the total net present value divided by the total amount of water saved over the planning period is $214/MG.

The water conservation plan was selected on the basis of public health and safety, the reliability of the water savings, the cost per million gallons of water saved, and by minimizing reliance on voluntary user cooperation, while maximizing the savings by targetting all sectors of water use. This plan will be implemented over the next several years in cooperation with the MDC users. The

water conservation plan selected by the MDC for implementation will become part of the preferred alternative and will be assessed as one alternative in the EIR.

EXISTING SAFE YIELD

The safe yield of a water supply system is the quantity of water that can be supplied on a continuous basis during a critical drought. If future water needs (including possible water savings from demand management) exceed the existing safe yield, an additional supply of water must be found to prevent shortages. The safe yield of the MDC system was determined by mathematical simulation using a computer program. The program consists of a series of mathematical equations that simulate the system using the fixed time increment of a month. The program uses a 50-year historic record of hydrology to represent future hydrology with inherent severe drought periods.

The calculations begin with a known reservoir storage at the start of the month. The watershed inflows and the precipitation on the reservoir, expressed as monthly volumes, are then added to the reservoir storage value. Evaporation and seepage losses are subtracted, as well as any minimum discharge requirement. If the resulting storage is sufficient to satisfy the water supply withdrawal, that volume is subtracted from storage and the entire calculation is repeated until all months of the hydrologic record have been simulated. If the monthly trial yield is greater than the available storage, the withdrawal will be less than desired, and the month is recorded as a failure event; the calculation proceeds until all months have been simulated. The total number of failures is recorded to calculate system reliability.

SELECTION OF SAFE YIELD FOR PLANNING

The result of this analysis is the selection for planning purposes of a safe yield value of 300 MGD. This means that MDC sources of supply can be relied upon to supply 300 MGD over a long dry period with 98.5 percent reliability. In order to maintain this reliability an aggressive drought response program for managing demand (including residential rationing to 30 GPD and 25 percent reduction in nondomestic use) will be likely to be required 57 months during the next 50 years.

The MDC selection of a final safe yield value for planning purposes is based on the following criteria.

- Since the MDC system serves a large population and has no back-up or emergency supply except for the small Sudbury system (e.g. a safe yield of 17 MGD for the Sudbury system can only be achieved by full-time operation, not emergency use), a conservative safe yield value was favored.

- Minimum pool levels were determined for Quabbin Reservoir (elevation 490) and Wachusetts Reservoir (elevation 387.5) based on maintaining water quality that could meet drinking water standards without treatment; and,

- A drought management plan was developed that proposed maximum acceptable actions to prevent system failures, i.e. lowering the reservoirs below their designated minimum pool elevations, etc., and thus increased the system safe yield.

A safe yield of 291 MGD (with zero system failures) is increased to 294 MGD by including the drought management plan in the analysis. Further, adjustment of the 50-year historical record to eliminate the bias of the extreme 1960's drought (i.e. the drought was presumed to have a recurrence frequency of once in one hundred and fifty years) resulted in a safe yield of approximately 300 MGD (this value is associated with a surrogate system reliability of 98.5 percent).

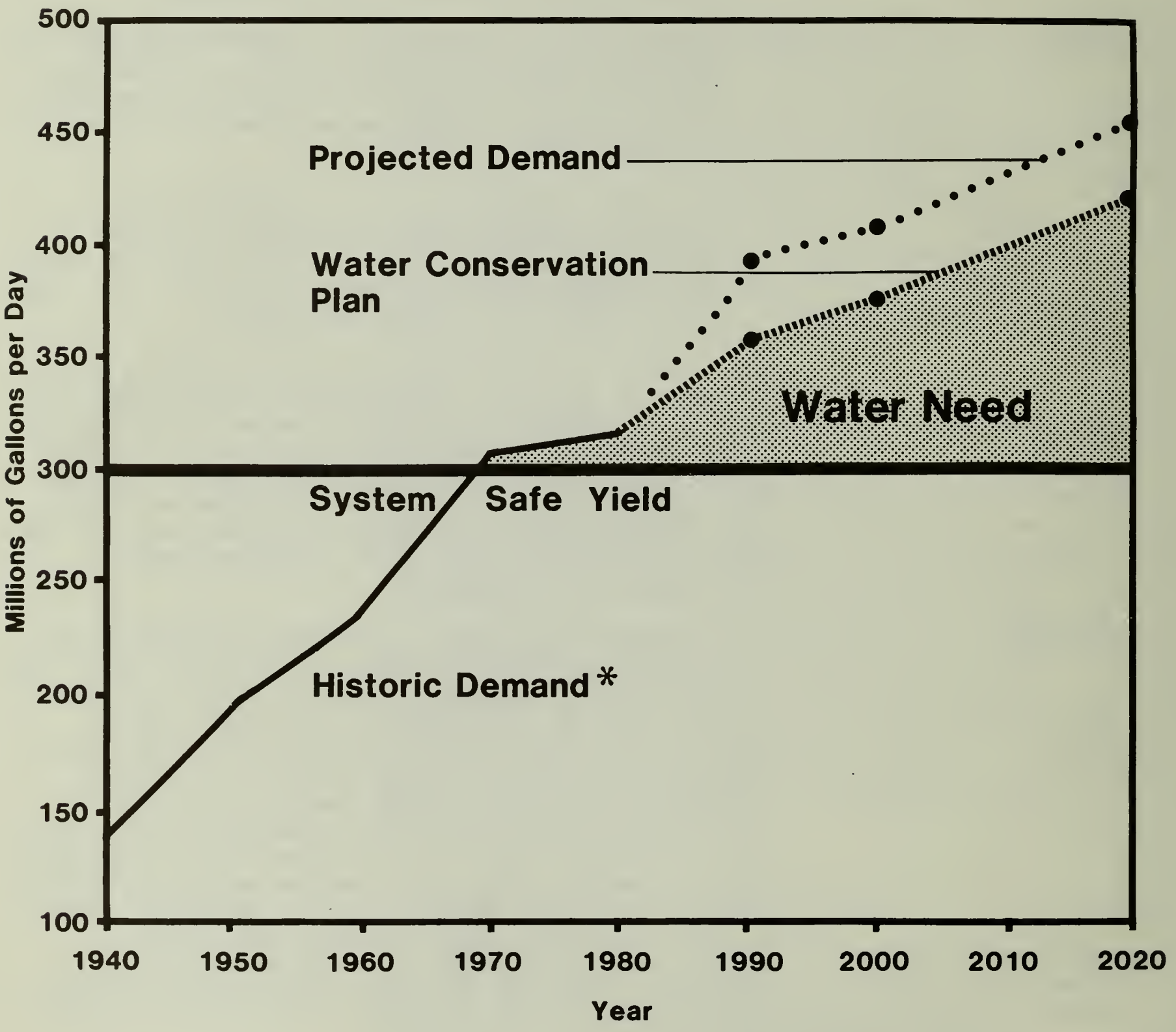
WATER NEEDS

The projected water needs of the MDC is 120 MGD by the year 2020 and is shown in Figure 3, "Projected Water Need for MDC Users". This projection represents a 35 percent increase over the 1980 demand on the system and is substantially less than the 140 percent by which demand increased over the previous 40 years. This figure incorporates the water savings expected to result from the implementation of the water conservation plan. The water savings from this plan is represented as a percent of total demand; actual water savings vary by community. The projected water needs for 1990 is 60 MGD and 75 MGD in 2000. This water needs projection is based on a current system safe yield of 300 MGD which assumes no additional yield from the Sudbury River Water Treatment Plant.

PUBLIC REVIEW AND COMMENT

Following the publication of each of the three reports that were involved in the development of the water needs projection, a technical workshop was held to explain and answer questions. Approximately 1000 reports and summaries were distributed to interested agencies and organizations and local officials and to each of eleven public libraries. Comments were received from the Water Supply Citizens Advisory Committee and others after each

Projected Water Need for MDC Users



* Historic demand does not include MDC system use and legal obligation.

Source: Wallace, Floyd, Associates Inc.

of these workshops and written responses to these comments were distributed. Copies of the comments and responses are available by contacting Wallace, Floyd, Associates Inc. at 1-800-322-0284.

The major comments on the water needs received from the Water Supply Citizens Advisory Committee, as submitted to the MDC Commissioners are outlined below.

- The water conservation plan prepared by the MDC should be adopted and implemented by the MDC.

- A drought response plan should be developed that is initiated earlier in a dry period and requires more participation by the water users than the current plan.

- Four aspects of the demand management and water demand projection analyses should receive further investigation, including:

  - the 52 MGD of "Other Unaccounted-For Water";
  - the estimate of "Recoverable Leakage";
  - the 50 MGD of "Legal Obligation"; and,
  - the 21 MGD of MDC "System Use".

Further comments to the Commissioners recommended that the MDC develop an active system management program and that these questions be addressed before establishing a water needs estimate for further planning work.

Additionally, comments on the water demand projections by the state Division of Water Resources questioned why the projected water demand of local communities was based on the average use and not on maximum use. The Sudbury Citizens Advisory Committee felt that the MDC should not necessarily plan on meeting all of its existing legal obligations and should explore possible future reductions in these.